

OPTIMISATION OF WHEEL DESIGN - REPORT 1: EFFECT OF WEB SHAPE ON THE BEHAVIOUR OF WHEELS SUBJECTED TO MECHANICAL AND THERMAL LOADING AT THE TREAD

This report presents a review of work carried out on the stress analysis of wheels, concentrating on the effects of mechanical loading from wheel/rail contact and thermal loading from tread braking on monobloc wheel designs. The results of various experimental and theoretical investigations are reviewed, but quantitative assessment of different designs is mainly based on finite element stress analyses carried out at BR and given in the appendix.

A typical lateral service load produces higher web stresses than vertical loads, but thermal loads from tread braking give higher web stresses than mechanical loads. Drag braking produces the highest web stresses. Wheel designs with the rim offset from the hub suffer large axial movements of the rim during tread braking and are not recommended for this type of duty. The advantages and disadvantages of the two designs without an offset rim – having straight web and double curve web – are given, and it is recommended that dynamometer testing should be carried out before the final choice is made.